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A Novel Approach for Investigating Standing Waves Using a Dual-Driven Vibrating String Apparatus

Chris Hatfield
Illinois Wesleyan University

William Brandon, Faculty Advisor
Illinois Wesleyan University

Andrew Morrison, Faculty Advisor
Illinois Wesleyan University

Poster Presentation P31

A NOVEL APPROACH FOR INVESTIGATING STANDING WAVES USING A DUAL-DRIVEN VIBRATING STRING APPARATUS

Chris Hatfield and William Brandon* and Andrew Morrison*
Physics Department, Illinois Wesleyan University

A harmonically driven stretched string is often used in the introductory physics laboratory to familiarize students with the concept of resonance and the notion of eigenmodes. The exercise is highly visual in that prominent vibration amplitudes will result under the proper resonance conditions. We have developed a novel approach to study string vibrations using a dual-driven vibrating string apparatus and the resulting behavior is described. Interestingly, we have found that the simple cases resulting from both drivers tuned to the same resonant frequencies with a predetermined relative phase have not previously been fully characterized. In addition, more fascinating phenomena emerge when we tune the drivers to different harmonics from one another while controlling their relative phase. Our motivation is to create a direct analogy between interference behavior in our simple apparatus and sum and difference frequency mixing such as that associated with nonlinear optical phenomena, and perhaps an indirect analogy to the superposition of states and the "collapse of a wavefunction" inherent to quantum systems.